fully treated, and many of the testing galleries employed for investigating the safety of explosives in coal mines are described. Many suggestions for the substitution of perfectly safe bodies in lieu of true explosives for this purpose are referred to. Among these may be noted the use of quicklime and its expansion on slaking; cartridges charged with liquid carbon dioxide or oxygen; but one of the most interesting methods was that introduced by M. Linde for the use of liquid air, in some cases a paper cartridge filled with kieselguhr and saturated with petroleum was then dipped in liquid air, the firing being carried out by a Bickford fuse or fulminate detonator. When the Simplon Tunnel was commenced in 1899 several attempts were made to utilise the explosive force of liquid air mixed with flour for blasting the rocks, but with unfavourable results. Liquid air alone, in metal cartridges, has also been tried for bringing down coal, but the author concludes that it does not seem an economic success.

Of more general interest is the important question of modern smokeless powders as propellants for military purposes. The Powers are fairly evenly divided in the choice between a gelatinised nitrocellulose powder or a nitrocellulose-nitroglycerine colloid. At one time the majority favoured the simple nitrocellulose powder, which is still retained by France and Russia, whilst Great Britain remains faithful to cordite, and Italy to ballistite. Germany may be said to be in a transition stage, for whilst employing a nitrocellulose for field guns, for the larger naval weapons a powder very similar to our modified cordite is employed.

All have had troubles to face with premature decomposition in magazines, and especially France. At Saigon in 1897 a quantity of poudre B ignited without setting fire to some black powder stored near by. 19,500 kilogrammes of this same powder had burnt with little damage in the previous year at the Saint-Médard factory, but the *Jena* disaster will ever be most prominently associated with this particular explosive, to which, in the author's opinion, it was wrongly attributed, whereas the special Commission appointed to inquire into the cause of this disaster believed it to be due to spontaneous decomposition of poudre B.

The instability of smokeless powders has led to the introduction of "stabilisers," the action of which is to absorb the oxides of nitrogen resulting from decomposition, which oxides, if present uncombined, greatly accelerate further decomposition. The author mentions a number of these, which include urea (American powder), diphenylamine (ballistite and the French powder BBo, first introduced after the *Jena* disaster), amyl alcohol (in the most recent French powders, AM_2 and AM_8), which appears to give excellent results. In cordite the vaseline acts as the stabiliser, although originally introduced for quite other purposes. It does not follow that for powders containing both nitroglycerine and nitrocellulose two stabilisers, one for each constituent, should be provided, as the author appears to think necessary.

Summarising the question of relative stability of the two classes of propellants the statement is made that gelatinised nitrated cottons possess more stability than the nitroglycerine-nitrocellulose powders, and although the velocity of the projectile is lower for the same charge they have marked advantages in lower temperatures on detonation, less erosive action on the rifling of the guns, and give less smoke. In view of the troubles experienced with simple nitrocellulose powders, the claim of their superior stability, *per se*, to cordite is open to question.

On the whole the volume will be found a useful work of reference on the composition, manufacture, and application of explosives for practically all purposes. It is more essentially a book suited to the requirements of the engineer or mining expert, and would not afford much information to the chemist or those engaged in the manufacture of explosives.

J. S. S. B.

A STATE MEDICAL SERVICE.

The Dawn of the Health Age. By Dr. B. Moore. Pp. ix+204. (London: J. and A. Churchill; Liverpool: The Liverpool Booksellers' Co., Ltd., 1911.) Price 3*s*. 6*d*. net.

THIS is a remarkable and noteworthy book, powerfully written, and very convincing on most of the points raised. Its aim is to demonstrate the necessity for entirely remodelling the present system of medical service, in the interests of the whole community. It goes far to show that hundreds of thousands of lives and millions of money could be saved annually if diseases were attacked on more scientific principles; and the main theme is that we allow diseases to invade and enfeeble us, and then make an attempt (often a poor one) at cure, instead of concentrating our efforts on prevention.

The first chapter is headed, "How we tinker with disease instead of stopping it." Therein it is pointed out that concerted, statesman-like action is demanded. The present undisciplined mob must be converted into a disciplined army; and there are signs foreshadowed by legislation dealing with some of the great problems of social reform, commencing with invalidity insurance and reform of the Poor Law, that we are turning in this direction. The organised army of doctors would cost the nation from eight to ten millions a year—an amount which is at present exceeded, but in a nationalised medical service the money would be paid through different channels. Under the new *régime,* medical treatment would be as free to everyone as is the education of to-day, and everyone would be bound to accept medical treatment in his own interests, just as to-day he accepts the education of his child. The author estimates that tuberculosis costs the country 16,000,000*l*. a year, and that it can be eradicated for an expenditure of less than 10,000,000*l*. a year for ten years, further expenditure almost stopping at the end of that period. He further maintains that tuberculosis and preventable infantile mortality together cost us more than double the price of an effectual national service for their prevention.

The main object of the national medical service would be twofold:—

(1) To give instruction in the laws of hygiene and healthy living, sowing this knowledge broadcast in both school and workshop.

(2) To take effective steps to stamp out infectious disease, assuming compulsory powers for this purpose.

We require a new system, including in organic coordination the private practitioners, the hospitals (voluntary and Poor Law), and their staffs, the infectious diseases and municipal hospitals and their staffs, the dispensaries, public and provident, the district medical officers and relieving officers, and the present so-called public health service.

"Let us wake up and be truly ashamed of ourselves," and having taught the school teachers the principles of hygiene, provide that this subject is taught in our schools as a compulsory and important one. Under our present medical service neither the medical practitioner nor the public health officer has any ambition to go forth and find the disease, not even if an epidemic is on; the disease must come to the doctor. The service is the more defective and incomplete in that many infectious diseases, and these often the most dangerous, are not even compulsorily notified.

It is maintained that a national medical service must arise in the end out of the general sickness and invalidity scheme now being contemplated by the Government. It is obvious that both the more economical and scientific way of dealing with disease is to catch it early and to stop it at its source.

> "So much of medical practice is becoming inefficient under the action of some of the local cooperative systems, clubs, societies, and tontines, that it is making the name of medical science a disgrace. It is turning doctors' private practices into fraudulently conducted business concerns, in which the doctor loses all dignity and self-respect, and the patient is cheated of that advice and treatment which he imagines is being given to him, and upon which his very life depends."

The last thing in this world to have cheap is medical advice. State insurance with a nationalised medical service is the only way out from this chaos. The medical officers should be transferable from one local centre to another, and open to promotion from one place to another. It is a liberal estimate to take the average income of the profession at 250*l.* per annum. The average annual pay for the doctor, under the State national medical service, would be somewhat more than 300*l.* a year, and taking it that a junior commenced at about 150*l.* a year, this would mean a system rising on ordinary promotions and good service to a maximum of 1000*l.*, and a small number of administrative officers at higher salaries. Probably about one-third of the profession would elect to remain on in private practice. The whole scheme would not be nearly so costly as the provision required under the Old Age Pensions Act, and it would prove quite as popular and as beneficial. The gain in disease stopped at incipient stages, and in increased health and corresponding power of his workpeople, together with regularity of work, less interrupted by illness, would more than repay the employer for his part of the contribution.

> "At least one adult in every seven of us is going to die of consumption, all because of this nefarious 'Wait till your ill system,' which no one has the courage to attack, and because we will not send doctors out on the highways and byways to find disease and haul it apart, so that they may stand between the healthy and infected, and the plague be stayed. As it is with consumption so it is with a hundred and one other disease conditions."

The author deals with our hospital system, its evils and abuses. It is argued that these provisions are only capable of doing about 15 per cent. of the work which they are intended to do; but they are a hopeless failure and a positive drawback, because they stand in the way of the introduction of a properly organised scientific effort. An organised system of State-controlled hospitals, in true coordination instead of chaos, would bring about a reduction of at least 50 per cent. of both disease and expense. The present hospitals are hopelessly out of touch with the present medical practitioners throughout the country, and this is highly detrimental to the public service, the hospitals themselves, and to the medical profession.

> "Under a State medical service and State hospitals for all members of the wage-earning classes, hospital abuse is done away with, because it simply cannot exist. The out-patient departments of our hospitals, like the 6*d.* dispensary practice of our slums, are two disgraces on the fair name and reputation of medical science. In both cases the times given are wholly inadequate for observation, care, and attention to the cases."

The writer demonstrates that the race is not relieved from suffering and death by the existence of a cure for the individual.

> "There is only one way given under heaven by which disease can be abolished and a finer and fitter race evolved, and that is by stopping the cause of disease, and throwing all our energies into the resistance of its spread."

Without a fairly complete separation of infective consumptives, no progress of any kind is possible. Therein lies the solution of that problem.

> "If we could only see the patients hit by the infection of phthisis as we do in smallpox the present order of things would not long be tolerated. As we are free from hydrophobia, so can we be free from tuberculosis when we find a statesman of the courage and fortitude of Mr. Walter Long to lead us to victory."

It is pointed out that in the evolution of the national medical service the friendly societies will be absorbed, the service will be thrown open to the whole of the medical profession, retiring allowances will be provided, and a State medical examination would become the single portal of entry to the medical profession which is so desirable. The voluntary hospitals would soon step into line with the rest of the service, and accept State support and control. The district assigned to each doctor would contain some four or five hundred families or houses. He would have a surgery; he would have no rivals worrying him, no bills to bother about, no suspense lest his patient thought he was after fees, and it would be to his interest to reduce work by keeping in touch at all times with the people for whose health he is responsible. He would at the same time act as an educating influence, and the absence of the dread of a fee to pay would further promote early treatment.

GEOLOGY FOR STUDENTS.

A Text-Book of Geology. By P. Lake and R. H. Rastall. Pp. xvi+494. (London: E. Arnold, 1910.) Price 16*s*. net.

THIS text-book will fill the gap between several excellent books of a more primary character and the great English work of reference which we owe to Sir Archibald Geikie. Mr. Rastall is responsible for the physical portion, and Mr. Lake for that dealing with stratigraphy.

Dr. J. E. Marr, as editor of "Arnold's Geological Series," to which the work belongs, states in his preface that

> "the stratigraphical portion of the book is occupied almost entirely with the study of the stratigraphy of the British Isles, which is sufficient for the purposes of elementary teaching."

This, however, is just the point on which there may be most difference of opinion. It may seem to some of us that in elementary teaching a view of the earth's history should be imparted on the broadest scale. The gaps in our insular stratified series should be filled in unhesitatingly from other lands. The progress of living things from Palæozoic to Quaternary types can be followed with interest even by a beginner in geology; but few people can take delight in British genera and species unless they can picture them in a setting of the successive faunas of the globe. The early editions of Lyell's "Principles of Geology" are appealed to by Dr. Marr as an example, yet nothing is more prominent in Lyell's work than his desire to establish a stratified sequence by observations made in many lands. Consider his table of "Recent and Tertiary Formations," on p. 61 of his third volume, published in 1833, and compare it with Mr. Lake's treatment of the same formations on pp. 439 and 453 of this modern text-book. Lyell, with a fascinating sweep, reminds us in his table of the delta of the Ganges, of Uddevalla, of Asti, and Perpignan, of the Superga, and of the volcanoes of the Velay. On p. 46 he regrets his ignorance of "many deposits known to exist in Spain and Portugal."

Many of us still share Lyell's regret, not because we want to carry in our heads the list of fossil species found on particular horizons, but because we want to fit the beds into the general scheme of stratified deposits. Lyell took his marine fossils as "medals which nature has chiefly selected to record the history of the former changes of the globe." Our universities, since his time, have established the cult of zones and horizons within the British Isles. The British Isles, moreover, have been accepted as consisting of England and Wales, and attention has become more and more concentrated on a limited area of the European outpost. Mr. Lake has worked well under these conditions, and no one will accuse him of ignorance of the wider aspects of the earth. We expect, however, a "text-book of geology" to convey to us some picture of the progress of life upon the globe. Of this we find only scanty traces in the 200 pages devoted to stratigraphical geology. The word "stratigraphical" has been allowed to dominate this section rigidly. In this respect numerous smaller text-books come nearer to the Lyellian conception of geology.

Mr. Lake's treatise, however, is indispensable for those who wish to bring their knowledge of British strata up to date. He has included, for instance, Mr. J. F. N. Green's revision of the St. David's area (p. 298); the probability of an unconformity in the Bala series, emphasising its division into Caradocian and Ashgillian (pp. 318 and 320); and Mr. Clement Reid's assignment of an Upper Oligocene age to the plant-beds of Bovey Tracey (p. 452).

A Scottish geologist may be provoked to find that the rocks which form the main mass of his highlands are described in six lines (p. 297). An Irish geologist will regret that the Dingle problem is dismissed in twenty-six words (p. 352), while the Lower London Tertiaries occupy two noble pages. But this lack of proportion is written large in the programmes of our public examinations.

Mr. Rastall's chapters on physical geology naturally make a wider appeal. Even the Dwyka conglomerate of South Africa is shown in one of the photographic plates, though no explanation appears to be given of its remarkably interesting characters. Spitsbergen and Alaska are well referred to, and the Tonga Islands, the great cone of Misti, and the wind-scored Sphinx, are used as illustrations of features that have a broad significance. The plates are chosen with much care, and the diagrams are as lucid as the accompanying text. Good examples of the author's treatment are to be found in the passages on desert-erosion (p. 69), and on river-capture (p. 45). Where so many physical matters have to be dealt with, few authors will agree as to the degree of prominence to be given to each. We should have liked to hear more of the many varieties of gneisses, and we note that the author regards thermal metamorphism as "usually of comparatively limited extent," a statement that is true enough of the rocks exposed in England. In the Transvaal, Rhodesia, Fennoscandia, and Canada, examples of a very different order may be found. Rock-cleavage is clearly described, and is illustrated by plates iv. and v., which might well be transferred, with their text, to the chapter on metamorphism two hundred and forty pages further on.

Mr. Rastall shows as much caution (pp. 100, 101, &c.) in dealing with the work of ice as his colleague does (p. 464) in dealing with the glacial epoch; but the main results of observation are very fairly stated, and the lessons of Arctic lands are applied to the British Isles. Is Spitsbergen, however, to be described (p. 99) as "a region of heavy precipitation"? Where the actual amount of melting is slight, glaciers, fed by broad snow expanses, can be maintained in an almost arid climate.

In this excellently produced book we have come across no misprints. "Porphyry," in the table on